

REMARKS

Entry and consideration of the foregoing Amendment is respectfully requested.

Claims 1-8, 10, and 14-19 and 21-44 are pending in this application.

Applicants are pleased to note the Examiner indicated that claims 41-44 are allowed.

Entry of this amendment is proper under 37 C.F.R. § 1.116 as the amendments:

(a) place the application in condition for allowance for the reasons discussed herein; (b) do not raise any new issues that would require further consideration and/or search as the amendments merely amplify issues discussed throughout the prosecution; (c) do not present any additional claims without canceling a corresponding number of claims; and (d) place the application in better form for appeal, should an appeal be necessary. The amendments are necessary and were not earlier presented as they are in response to arguments raised in the final rejection. Entry of the Amendment is respectfully requested.

Claim Rejection – 35 USC § 103

Claims 20, 22-40 were rejected under 35 USC § 103(a) over Mori *et al.* (US Pat. No. 6,268,904) in view of Montcalm *et al.* (US Pat. No. 5,958,605).

Claim 20 has been cancelled without prejudice or disclaimer. Therefore, the rejection of claim 20 under § 103(a) is rendered moot.

Claims 22-25 and claims 28-29 have been amended to depend from claim 21. Claim 21 has been rewritten in independent form.

Claim 21 recites, *inter-alia*, "...capping layer being formed of a relatively inert material, wherein said relatively inert material is selected from the group consisting of: diamond-like carbon (C), Ru, Rh, Au, MgF<sub>2</sub>, LiF, C<sub>2</sub>F<sub>4</sub>, TiN and compounds and alloys thereof."

The Office Action contends that Mori *et al.* disclose a projection optical system comprising substantially all basic features of the instant claims. The Office Action admits, however, that Mori *et al.* do not expressly disclose at least one of the optical elements in the illumination optical system or in the projection system such as a sensor or a lens or a reflector having a surface which is relatively coated by a relatively inert material capping layer such as diamond-like carbon, boron nitride, boron carbide, silicon nitride, silicon carbide, B, Pd, Ru, Rh, Au, MgF<sub>2</sub>, LiF, C<sub>2</sub>F<sub>4</sub>, TiN, compounds and alloys. The Office action contends that Montcalm *et al.* disclose an extreme ultraviolet projection apparatus having optical elements with a "relatively inert material" including "molybdenum-silicon, molybdenum carbide-silicon, molybdenum-beryllium and molybdenum-beryllium and molybdenum carbide-

beryllium or carbon and palladium, or compound material such as carbides, borides, nitrides, and oxides” deposited for the purpose of preventing oxidation and corrosion and thus it would have been obvious to one of ordinary skill in the art to incorporate the teachings of Mori *et al.* and Montcalm *et al.* to obtain the invention as claimed. Applicant respectfully disagrees.

Montcalm *et al.* does not disclose, teach or suggest using a relatively inert material as a capping layer, the relatively inert material selected from the group consisting of diamond-like carbon (C), Ru, Rh, Au, MgF<sub>2</sub>, LiF, C<sub>2</sub>F<sub>4</sub>, TiN and compounds and alloys thereof. Indeed, Montcalm *et al.* merely teaches, in col. 2, lines 20-24, using oxidation resistant materials such as molybdenum carbide, boron carbide, molybdenum boride, boron nitride, molybdenum oxide, silicon nitride, beryllium oxide, silicon carbide, and silicon oxide. Consequently, Montcalm *et al.* teaches away from using the materials recited in claim 21, i.e. diamond-like carbon (C), Ru, Rh, Au, MgF<sub>2</sub>, LiF, C<sub>2</sub>F<sub>4</sub>, TiN and compounds and alloys thereof.

Since neither reference, taken alone or in combination, teaches or suggests the relatively inert material is selected from the group consisting of: diamond-like carbon (C), Ru, Rh, Au, MgF<sub>2</sub>, LiF, C<sub>2</sub>F<sub>4</sub>, TiN and compounds and alloys thereof, Applicants respectfully submit that the Office Action fails to present a *prima-facie* case of obviousness.

With regard to claim 30-40, Applicants reiterate the argument filed January 17, 2003. Specifically, the reflector recited in claim 30 has a multilayer coating having only a capping layer (monolayer). In contrast, Montcalm *et al.* show using a reflective coating having a bilayer as a capping layer. Montcalm *et al.* do not teach or suggest using one capping layer. Applicants have determined through experimentation (see for example tables 5 and 6 and related description at page 17 of the specification) that the use of a single layer allows production of a reflective layer with improved reflectivity while exhibiting a high degree of resistance to chemical attack (see, page 17, lines 24-26 in the specification), for example, oxidation. Per MPEP 2144.08, evidence that the compound or composition possesses superior and unexpected properties can be sufficient to rebut a *prima facie* case of obviousness. *In re Chupp*, 816 F.2d 643, 646, 2 USPQ2d 1437, 1439 (Fed. Cir. 1987).

Therefore, for at least the above reasons, Applicants submit that claim 21 and claim 30 and claims 22-29 and claims 31-40 which are dependent directly or indirectly from either claim 21 or claim 30 are patentable. It is, thus, respectfully requested that the rejection of claims 20, 22-40 under § 103(a) be withdrawn.

Claims 1-8, 10, 14-19, 21 were rejected under 35 USC § 103(a) over Mori *et al.* (US Pat. No. 6,268,904) in view of Montcalm *et al.* (US Pat. No. 5,958,605) and further in view of Early *et al.* (US Pat. No. 5,356,662). Applicants respectfully traverse this rejection for at least the following reasons.

The Office Action contends that Mori *et al.* as modified by Montcalm *et al.* discloses substantially all limitations of the claim. The Office Action, however, concedes that neither Mori *et al.* nor Montcalm *et al.* disclose using an inert material selected from the group consisting of diamond-like carbon (C), Ru, Rh, Au, MgF<sub>2</sub>, LiF, C<sub>2</sub>F<sub>4</sub>, TiN and compounds and alloys thereof. The Office Action contends that Early *et al.* teaches an optical element which is coated by an inert material such as rhodium (Rh), ruthenium (Ru) and thus it would have been obvious to one of ordinary skill in the art to incorporate the teachings of Mori *et al.*, Montcalm *et al.* and Early *et al.* to obtain the invention as claimed. Applicants respectfully disagree.

Early *et al.* merely teaches a method for repairing an optical element which includes a multilayer coating. In col. 2, lines 30-68, Early *et al.* teaches that due to loss of reflectivity over time in the optical element repair is needed and one method of repairing the optical element is by stripping the defective multilayer coating by using an etchant. Early *et al.* teaches that the presence of a barrier layer resistant to the etchant between a substrate and the multilayer coating reduces damage to the substrate. Early *et al.* simply teaches that ruthenium is appropriate as a barrier material between the substrate and the multilayer coating because ruthenium is relatively insoluble in bases, acids and aqua regia (see, col. 8, lines 1-5 in Early *et al.*). Early also simply teaches that iridium, boron and rhodium are also appropriate as barrier materials.

Therefore, Early *et al.* uses ruthenium and rhodium for a completely different purpose than as a capping layer of a relatively inert material as recited in claims 1, 15 and 21. Consequently, Early *et al.* teaches away from using ruthenium and rhodium as a capping layer and thus one of ordinary skill in the art would not have been motivated to combine Early *et al.* with Mori *et al.* in view of Montcalm *et al.*

Therefore, for at least the above reasons, Applicants submit that claims 1, 15 and 21, and claims 2-8, 10, 14, 16-19 and 21 which are dependent from either claim 1 or claim 15, are patentable. It is, thus, respectfully requested that the rejection of claims 1-8, 10, 14-19 and 21 under § 103(a) be withdrawn.

Claims 1-8, 10 and 14-40 were rejected under 35 USC § 103(a) over Nishi *et al.* (US Pat. No. 6,414,743). Applicants respectfully traverse this rejection for at least the following reasons.

The Office Action contends that Nishi *et al.* discloses an exposure apparatus comprising substantially all the elements recited in the claims but concedes that Nishi *et al.* does not expressly teach “at least one of the illumination system and projection system having an optical element with a surface on which radiation is incident and a capping layer covering the surface, the capping layer being formed of a relatively inert material, wherein said relatively inert material is selected from the group consisting of: diamond-like carbon (C), Ru, Rh, Au, MgF<sub>2</sub>, LiF, C<sub>2</sub>F<sub>4</sub>, TiN and compounds and alloys thereof.” The Office Action contends, however, that Nishi *et al.* teaches optical elements in the Exposure apparatus can be made of glass materials such as magnesium fluoride (MgF<sub>2</sub>) and lithium fluoride (LiF). And thus it would have been obvious to one of ordinary skill in the art to incorporate the teachings of Nishi *et al.* to obtain the invention as claimed. Applicants respectfully disagree.

The mere teaching of glass materials such as magnesium fluoride (MgF<sub>2</sub>) and lithium fluoride (LiF) in Nishi *et al.* is not by itself a suggestion that MgF<sub>2</sub> and LiF can be used as an inert material in a capping layer. Nishi *et al.* merely teaches that magnesium fluoride (MgF<sub>2</sub>) and lithium fluoride (LiF) are suitable glass materials for transmissive lenses only. Nishi *et al.* does not disclose, teach or suggest a capping layer covering the surface of an optical element, the capping layer being formed of a relatively inert material, as recited in claims 1, 15, 21 and 30. Moreover, Nishi *et al.* is completely silent about using magnesium fluoride (MgF<sub>2</sub>) and lithium fluoride (LiF) in a multilayer structure and there is no suggestion in Nishi *et al.* about the properties of magnesium fluoride (MgF<sub>2</sub>) and lithium fluoride (LiF) that would make these compounds suitable for use as a capping layer. To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). “All words in a claim must be considered in judging the patentability of that claim against the prior art.” *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). See MPEP 2143.03.

Consequently, for at least the above reasons, Applicants submit that the Office Action fails to present a *prima facie* case of obviousness.

Therefore, Applicants respectfully submit that claims 1, 15, 21 and 30, and claims 2-8, 10, 14, 16-40 which are directly or indirectly dependent from either claim 1, claim 15,

claim 21 and claim 10, are patentable. It is, thus, respectfully requested that the rejection of claims 1-8, 10 and 14-40 under § 103(a) be withdrawn.

CONCLUSION

In view of the foregoing, the claims are now in form for allowance, and such action is hereby solicited. If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, he is kindly requested to contact the undersigned at the telephone number listed below.

Attached is a marked-up version of the changes made to the specification and claims by the current amendment. The attached Appendix is captioned **"Version with markings to show changes made"**.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in a condition for allowance and a Notice to that effect is earnestly solicited.

Respectfully submitted,

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Enclosures: Appendix

**APPENDIX: VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**IN THE CLAIMS**

Claim 20 has been cancelled without prejudice or disclaimer.

The claims have been amended as shown below:

21. (Three Times Amended) [The lithographic projection apparatus according to claim 20,]

A lithographic projection apparatus, comprising:  
an illumination system constructed and arranged to supply a projection beam of radiation;  
a first object table provided with a first object holder constructed and arranged to hold a mask;  
a second object table provided with a second object holder constructed and arranged to hold a substrate;  
a projection system constructed and arranged to utilize said radiation to image an irradiated portion of the mask onto a target portion of the substrate; and  
at least one of said illumination system and projection system having a sensor with a surface on which radiation is incident and a capping layer covering said surface, said capping layer being formed of a relatively inert material,

wherein said relatively inert material is selected from the group consisting of: diamond-like carbon (C), Ru, Rh, Au, MgF<sub>2</sub>, LiF, C<sub>2</sub>F<sub>4</sub>, TiN and compounds and alloys thereof.

22. (Amended) The lithographic projection apparatus according to claim [20] 21, wherein said relatively inert material is more inert than material from which remaining portions of said sensor are formed.

23. (Amended) The lithographic projection apparatus according to claim [20] 21, wherein said relatively inert material is less easily oxidized than the material from which remaining portions of said sensor are formed.

24. (Amended) The lithographic projection apparatus according to claim [20] 21, wherein said relatively inert material is harder than material from which remaining portions of said sensor is formed.
25. (Amended) The lithographic projection apparatus according to claim [20] 21, wherein said capping layer has a thickness in the range of from 0.5 nm to 10 nm.
28. (Amended) The lithographic projection apparatus according to claim [20] 21, wherein said capping layer comprises two sub-layers of different materials.
29. (Amended) The lithographic projection apparatus according to claim [20] 21, wherein said projection beam comprises radiation having a wavelength in the range of from 8 nm to 20 nm.

End of Appendix